Pelagic Marine Important Bird Areas for New Zealand

Report for the Royal Forest and Bird Protection Society

Draft for Review by 3 April 2009

Susan Waugh

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Summary

This discussion paper sets out the draft analyses developed for delimiting Important Bird Areas (IBAs) in the pelagic areas of the New Zealand Exclusive Economic Zone (NZEEZ). This paper will be revised in April, and a proposal of areas for IBA designation will be formulated following scientific review of these findings.

This analysis provides part one in a series of papers that delineate proposed IBAs for seabird colonies and coastal areas, and for terrestrial areas of New Zealand. It is envisaged that the identification of IBAs in New Zealand will be an iterative process that develops over several years, as new information is reviewed, or becomes available.

We using the existing set of IBA criteria, and followed guidelines developed by collegues in Europe for their application to marine areas. As the delineation of IBAs in the marine environment remains an ongoing area of research, we are seeking a scientific review of the methodologies applied here.

In this analysis, we identify 10 main areas within the NZEEZ which could be proposed for IBA designation. Adjacent areas, areas where fisheries mortality have been observed don't fit under the current criteria. We also examine gaps in the current datasets, which are likely to hamper the definition of the full suite of IBAs necessary to define the habitats used by seabirds in New Zealand waters.

Note to reviewers

We would appreciate your input into the analyses, and seek your comments as a review on both the application of the IBA criteria to the data (data used are detailed in Appendix 2), and to highlight any outstanding data source that we may have overlooked.

For the current analysis, we have relied heavily on data which has been submitted to the BirdLife Global Procellariiform Tracking Database. It would obviously be of great benefit if additional data, not yet available through that database could be made available for inclusion in the analyses, and to the database. Other data were contributed by the Ministry of Fisheries, mainly from the NABIS database system, by individual data contributors, and from the BirdLife World Bird Database.

We would appreciate the reviewers' comments on the utility of including these areas, such as those where extensive seabird mortality in fisheries occurs, which don't current fall under the existing IBA criteria. It would be interesting to get reviewers comments on this, and whether any revisions of the marine IBA criteria are needed, with a view to ongoing analyses for areas outside of New Zealand.

We would greatly appreciate if you could provide your comments on the paper by 3 April 2009.

Thank you

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Introduction

Why have IBAs?

"The aim of the Important Bird Areas (IBAs) programme is to identify and protect a network of sites at a biogeographic scale, critical for the long-term viability of naturally occurring bird populations, across the range of those bird species for which a site-based approach is appropriate. The network is considered the minimum essential to ensure the survival of these species." (Fishpool & Evans 2001). The IBA programme in New Zealand seeks to identify, document, and work towards the conservation and sustainable management of globally important areas for bird conservation (Box 1).

Box 1: The Important Bird Areas (IBA) Programme of BirdLife International

- The function of the Important Bird Areas (IBA) Programme is to identify, protect and manage a network of sites that are important for the long-term viability of naturally occurring bird populations, across the geographical range of those bird species for which a site-based approach is appropriate.
- The continued ecological integrity of these sites will be decisive in maintaining and conserving such birds. Legal protection, management and monitoring of these crucial sites will all be important targets for action, and many (but not all) bird species may be effectively conserved by these means. Patterns of bird distribution are such that, in most cases, it is possible to select sites that support many species.
- The IBA Programme is global in scale, and it is anticipated that up to 20,000 IBAs will be identified worldwide, using standard, internationally recognized criteria for selection. The sites are identified on the basis of the bird numbers and species' complements that they hold, and are selected such that, taken together, they form a network throughout the species biogeographic distributions.
- This network may be considered as a minimum essential to ensure the survival of these species across their ranges, should there occur a net loss of remaining habitat elsewhere through human, or other, modification. Therefore, the consequences of the loss of any one of these sites may be disproportionately large.
- The programme aims to guide the implementation of national conservation strategies, through the promotion and development of national protected-area programmes. It is also intended to assist the conservation activities of international organizations and to promote the implementation of global agreements and regional measures.

In developing countries, IBAs assist with assuring the well-being and security of lifestyle for impoverished communities, with positive social, cultural and economic benefits from the implementation of habitat protection through IBA designation (BirdLife International 2006). Across countries at all levels of development, IBAs provide a basis for reinforcing conservation actions through protected areas, and identifying areas where greater protection or management is needed. For example in Africa, 40% of IBAs are designated as IUCN Category I-VI protected areas, and 80% of the regions threatened species occur within these areas (Fishpool et al. 2009). This allows for a focus of efforts to protect the remaining 60% of IBAs as protected areas, and provide better protection for the 20% of species occurring outside protected areas. In this way, IBAs provide a tool for independent review of the adequacy of a country's protected area network.

BirdLife analyses (Osieck 2004, Howgate and Lascelles 2007) describe the application of IBAs to marine areas. They identify the main benefits of this work being that governments and conservation organizations can define areas for specific management or protection actions. Adaptation of the methodology for identifying IBAs to marine areas is an area of ongoing research and development. Approximately 2100 candidate marine IBAs have been identified in 158 countries on the basis of seabirds triggering either global or regional criteria for IBA designation. Data from the BirdLife World Bird Database were used extensively in this analysis. To date, no areas had been identified for New Zealand marine or terrestrial systems, though for the Australasia and Oceania regions, 81 candidate marine IBAs have been identified corresponding to <1% of the total identified marine IBA areas globally. Due to the work being done currently as part of the BirdLife Global Seabird Programme in New Zealand, it was decided that pelagic marine IBAs would be those examined first. This was largely due to the availability of data for these areas, not because they are considered a higher priority in absolute terms. Inventory of seabird coastal and nearshore areas will follow, along with analysis of terrestrial IBAs over the next 2 years.

New Zealand is widely recognized as the seabird capital of the world, with around 1/3 of the world's three hundred-odd seabird species occurring within the extensive EEZ. Four areas in New Zealand are identified as areas of importance because of the high level of endemism of species found there Endemic Bird Areas (EBAs): North and South Islands, Chatham Islands, Auckland Islands (Stattersfield et al. 1998).These areas include many localities where seabirds are prevalent. EBAs identify areas where restricted range species occur, for areas where two or more species overlap in their ranges. EBAs are defined by examining the distribution of species with ranges of less than 50,000 km^2, and included a data set that went back to the 1800s. This definition excludes many seabirds, which tend to breed in dense colonies, but range widely at sea to exploit sparse resources.

More recently, BirdLife partners working in countries around the world have designated areas of particular importance to current-day bird populations: Important Bird Areas. This designation covers areas which contain either core ranges of threatened species, an important proportion of the global population of a species, or assemblages of birds at particular times of year. Since 2007, BirdLife has worked to apply the IBA methodology to marine as well as terrestrial areas, which is of particular relevance in New Zealand, given the high level of marine bird diversity in the New Zealand region.

Pelagic marine IBAs

New Zealand's marine zone covers a wide range of bio-geographic zones, from the tropics to the sub-Antarctic. The large continental shelf area (5.7million km^2, approximately the size of Australia), provides diverse habitats for the eighty-four marine birds that are recognized to breed to the area, including 37 endemic seabird species. It is therefore expected that the candidate IBAs that will be identified for New Zealand are likely to be important in defining zones of importance for marine birds, globally.

Characteristics of IBAs

The key characteristics of IBAs are that they:

- Are places of international significance for the conservation of birds at the global, regional or sub-regional levels;
- Are practical tools for conservation;
- Are chosen using standardized, agreed criteria applied with common sense;
- Must, wherever possible, be large enough to support self-sustaining populations of those species for which they are important;

- Must be amenable to conservation and, as far as possible, be delimited from surrounding areas;
- Will preferentially include, where appropriate, existing Protected Area Networks;
- Are not appropriate for all bird species, and for some are only so in parts of their ranges; and
- Should form part of a wider, integrated approach to conservation that embraces sites, species and habitat protection".

In discussing the definition of boundaries of IBAs in marine environments, Osieck (2004) identified that, as far as possible, an IBA:

- Has a distinctive character that sets it apart from surrounding areas either in physical characteristics or in terms of the importance for bird species;
- Has no fixed maximum or minimum size but should be of a 'practical' size for management – consideration should be given to combining several small candidate areas into one larger area where appropriate;
- Should be defined along existing geographical boundaries;
- Should be an area which can in some way be managed. This has implications for the selection of areas at sea where ability to manage is severely curtailed such as High Seas areas of the ocean (i.e. outside of EEZs).

Objectives

The objectives of this study are:

1. To identify and document candidate Marine Important Bird Areas for New Zealand for pelagic areas;
2. To identify data gaps to contribute to ongoing analyses of Marine IBAs

Methods

In this section, we discuss the data sources, analyses, and process used for defining candidate Marine IBAs for the offshore area of the New Zealand Exclusive Economic Zone (NZEEZ).

IBA Criteria

The global criteria that define Important Bird Areas are used to define candidate IBAs for marine areas are set out in Box 2.

Box 2: IBA criteria applied to marine areas

A1. *Species of global conservation concern* The site regularly holds significant numbers of a globally threatened species, or other species of global conservation concern.

A2. *Restricted-range species* The site is known or thought to hold a significant component of the restricted range species whose breeding distributions define an Endemic Bird Area (EBA) or Secondary Area (SA).

A3. *Biome-restricted species* The site is known or thought to hold a significant assemblage of the species whose breeding distributions are largely or wholly confined to one biome.

A4. *Congregations (proposed revised criteria).* A site is a focus of congregation at which ≥1% of the global population of a species is known or thought to occur on a regular or predictable basis
a) simultaneously or
b) cumulatively, within a limited period

For the New Zealand pelagic marine IBAs, Criteria A1 and A4 are the only criteria used for the current analyses, as for other criteria, data were lacking, or they were not considered applicable. The types of areas considered in this report correspond to the first of four main types of marine IBA identified by marine IBA studies in Europe (SEO/BirdLife 2008), set out below:

1. *Areas for pelagic species*. These sites comprise marine areas often remote from land at which pelagic seabirds occur regularly in large numbers, whether to feed or for other purposes. These areas usually coincide with specific oceanographic features related with high biological productivity.
2. *Migration Bottlenecks*. These are areas that, due to geographical constraints, act as true bottlenecks for the migration of seabirds.
3. *Seaward extensions to breeding colonies*. Seabirds tend to nest colonially, and thus occur in large numbers at the breeding sites and their surroundings. This approach is intended to account for the marine area surrounding important seabird colonies, already designated as IBAs in their land portion.
4. *Non-breeding (coastal) concentrations*. These include sites, usually in coastal areas, which hold feeding and moulting concentrations of waterbirds, such as divers, grebes, and seaducks.

For the current analysis, our focus was on the areas for pelagic species (1. above). Data to address area types 2, 3, and 4, above, are currently being collated.

Areas considered

The area considered was within the NZEEZ. This 4.4 million km^2 area is the fourth largest EEZ in the world, and contains diverse habitats, from up to 10,000 m deep Kermadec Trench to coastal estuaries, ranging from tropical to sub-Antarctic waters (26^oS to 56^o S). Within this area, we also used the Fisheries Management Areas (FMAs) (New Zealand 1996) to define some boundaries of the proposed IBAs. These ten FMAs divide the NZEEZ a) following roughly the different bio-geographical gradients throughout the zone and b) into the management units which marine protection standards are likely to be applied.

Species considered

Over 15,000 marine species have been identified within the New Zealand EEZ, while around four times that number are considered by researchers to remain unidentified (Ministry of Fisheries 2009). This could comprise up to 10 percent of the worlds marine biota. For marine bird species, a high proportion of the world's total biodiversity is represented in the New Zealand region, with around 1/3 of the world's seabirds frequenting the NZEEZ. The birds considered in this analysis were selected, based on BirdLife International taxonomy (BirdLife International 2008). The species list for the analysis is set out in Appendix 1, and summarized in Table 2. Due to lack of adequate data, not all species from the 9 families represented were able to be included in the analyses. The group of birds examined included species which were marine dependent, and comprised 21 species from four families (Table 2). Petrels and albatrosses are represented in greater numbers in than other groups, as we primarily considered at-sea distribution data (e.g. from satellite tracking or sightings at-sea), for species which are globally threatened (IUCN status of Vulnerable, Endangered, or Critical).

Table 2 – Families of birds present in the New Zealand EEZ and considered in the definition of candidate Pelagic Marine IBAs

Family	*Number of species listed by IUCN as Threatened (Critical, Endangered or Vulnerable)*	*Number of species listed by IUCN as Non-Threatened (Near Threatened or Least Concern*	*Total NZ breeding species*	*Included in the Pelagic IBAs analysis on the basis of threat status and data availability*
Albatrosses	8	3	11	8
Storm petrels	1	4	5	0
Diving petrels	0	2	2	0
Tropic birds	0	1	1	0
Cormorants (shags)	7	2	9	5
Petrels	11	17	28	5
Penguins	5	1	6	3
Skuas	0	1	1	0
Gulls & Terns	1	10	11	0
Gannets & Boobies	0	2	2	0
Grand Total	33	43	76	21

Data Gaps

In this study, we were limited in the delineation of IBAs for the majority of the species occurring in the New Zealand zone by the absence of adequate data. This means that the areas defined in this report are likely to be a subset of the total areas of marine IBAs that could be designated. With the addition of new data, we will be able to include areas outside the continental shelf area.

We examined the data availability for the 76 species included in the analyses, in relation to their IUCN threat classification (Appendix 1).

Data were determined to be lacking if either BirdLife Global Procellariiform Tracking Database data (greater than 20 individuals per life-stage), or NABIS layers were unavailable. In some cases a small number of individuals were tracked for some species, but these were deemed unusable in the analyses. In these cases, we indicated a data gap. Data gaps were indicated for whole species, or for non-breeding life stages (adults outside of the breeding season or pre-breeding individuals). This distinction applies principally to the albatrosses and larger petrels, some of which have been studied mainly in the adult breeding periods. We applied these criteria to all the species considered in this analysis, in relation to their IUCN threat classification (Table 3, but see Appendix 1 for detail of data availability)

Table 3. The data gaps for 77 species included in the analyses, in relation to their IUCN threat status.

IUCN threat status	Number of species in the analyses	Number of species entirely lacking data (% of all species this category)	Number of species lacking data for mainly non-breeding life stages
Critical	4	3 (75%)	0
Endangered	9	6 (67%)	1
Vulnerable	20	13 (65%)	4
All species	76	58 (76%)	5

For critical species, 75% were entirely lacking data that could be used in the analyses. Similar percentages were found for endangered (67%) and vulnerable species (70%), and for all species together (76%). Therefore we conclude that the marine IBA analyses presented here for threatened species under the A1 criterion, data for three quarters of the species that should be considered is unavailable. For some of these species, the areas of most intensive usage are likely to fall within the current candidate IBA areas; therefore adding some new species data would be unlikely to change the current proposed IBA boundaries. For other species or life-stages of these species, however, the current candidate areas will not cover their ranges. We anticipate that a staged process of new data gathering will be necessary to address these data gaps.

A number of data sets exist but were not available, or are in the process of being collected (see Appendix 1 for details). The critical species and a few of the endangered species are addressed by these programmes. These new data, if made available in the future to the IBA analysis, should strengthen and extend the proposed IBA areas.

At the time we undertook the analyses, we were aware that only a small proportion of the total number of species found in the NZEEZ had data of sufficient quality to be included in the study. Therefore we considered analyses using the A4 criterion, for congregations of species, including non-threatened species, could be compromised by the data gaps. We hope that in a relatively short period, with additional research on these species, we will be able complete analyses under the A4 criterion.

Data collection priorities

There is a clear need to gather new data for a range of previously unstudied species or those studied in only a limited way. Of highest priority should be the critical species (Chatham shag, New Zealand Storm-petrel, magenta petrel). The lack of data on the distribution of these species at sea may be a significant problem for defining threats to their continued existence.

For endangered species, the four species entirely lacking distributional information are black-fronted tern, black-browed albatross, Chatham petrel, and erect-crested penguin. These species are an obvious second priority for research.

For vulnerable species, distributional information could be strengthened to enable foraging hot-spots to be determined from remote tracking or other techniques. Species lacking data include: Campbell Island shag, grey-headed and Campbell albatross, Pycroft's and white-necked petrels, Buller's shearwater, Fiordland, Snares and Rock-hopper penguins. For Antipodean and southern royal albatross, Parkinson's (Black) and Westland petrels data on non-breeding life stages is lacking.

Biological and Environmental data sources

Data from the following sources were used identify candidate pelagic Marine IBAs:

- BirdLife World Bird Database – species distributions and biological information
- BirdLife Global Tracking Database data- 50% kernel distributions
- National Aquatic Biodiversity Information System layers (hotspots) for species (NABIS 2009).
- GIS bathymetry layers for coastline, 200m, 1000m depth (Source Ministry of Fisheries).
- Locations of seamounts (Source Ministry of Fisheries)
- Locations of fisheries mortalities by species (Source Ministry of Fisheries)

Applying the IBAs criteria to marine sites

Areas for pelagic species

When defining IBAs for terrestrial species, the global IBA criteria allow areas to be proposed and designated on the basis of the occurrence of a single species, with sufficient numbers or proportion of the global population. We defined candidate marine IBAs in pelagic areas, following the process and data selection criteria developed by our European colleagues for areas used by pelagic species (SEO/BirdLife 2008). This called for a higher threshold of species occurrence, in that two or more data layers showing use of an area by a species or several species was required for a marine IBA to be proposed:

Selecting distributional data:

1. Satellite tracking data for greater than 20 individuals, from one life-stage or part of the breeding cycle (source BirdLife Global Procellariiform Tracking Database; Small 2004). Across all species (or sub-groups within species), only the 50% utility distributions only were used. These areas correspond to the main breeding season foraging area for those species which were tracked during breeding, and are thus an indicator of a strong concentration of individuals;

Or where species data did not meet this threshold:

2. NABIS hot-spot layer – these data contain a combination of species at-sea sightings, satellite tracking data (fewer than 20 individuals), and fisheries catch locations, or are based on foraging ranges for species (e.g. penguins) which have been subject to colony-based studies (NABIS 2009).

Basic marine IBA delineation:

3. Where the distributional data layers (above) for two or more species or sub-groups overlapped, the resulting overlap area was considered a potential marine IBA. In the case of many areas in the NZEEZ, several species ranges overlapped simultaneously (coloured dark-blue to red on the maps depending on the number of overlapping species ranges).
4. These areas were examined, and enlarged or reduced in relation to existing geographic layers (1000 m depth contour was used to define the boundary of areas in several cases), or in relation to fishery management boundaries (here used only to split large candidate IBAs into smaller parts).

Ensuring adequate coverage of threatened species ranges:

5. For Parkinson's (Black) petrel *Procellaria parkinsoni* the area of its range that was overlapped by that of another species did not cover the majority of the species core range. Therefore the candidate IBA for this species was extended to cover the entire area of the core range (the 50% utility distribution of Parkinson's (Black) petrel), within the NZEEZ.
6. For Campbell albatross *Thalassarche impavida*, the candidate IBA for which two species ranges overlapped covered only a small area around the breeding site for the species, while this species range covered the entire Campbell Plateau and adjacent continental shelf areas. Therefore, the candidate IBA in this area was extended to follow a line combining the 1000 m depth contour and the edge of the species range as defined by the NABIS hotspot for the species.
7. For New Zealand king shag *Phalacrocorax carunculatus,* the candidate IBA defined around the main area of distribution of this species did not overlap with that of any other species, except in its northern extremity. In order to define an IBA that adequately provided for the core requirements of this species, we therefore used the outline of this specie's distribution to define the boundary.

Results and Discussion

Candidate IBAs

Ten areas within the NZEEZ have been delineated as candidate IBAs following these analyses. These combine the data for 21 threatened seabird species. In the areas with the most intensive species overlap, up to 7 species ranges co-occur. In all cases, the areas defined are triggered by the A1 criterion for marine areas, which are areas of significance for globally threatened species.

We consider that the areas defined here represent a minimum of marine IBAs that could be defined for New Zealand species, as detailed data for many species are lacking. As these data are gathered and/or become available for inclusion in the IBA analysis, additional areas are likely to be added. The key data gaps are discussed in an earlier section. The candidate IBAs are numbered by the Fishery Management Area in which they fall (Figure 1).

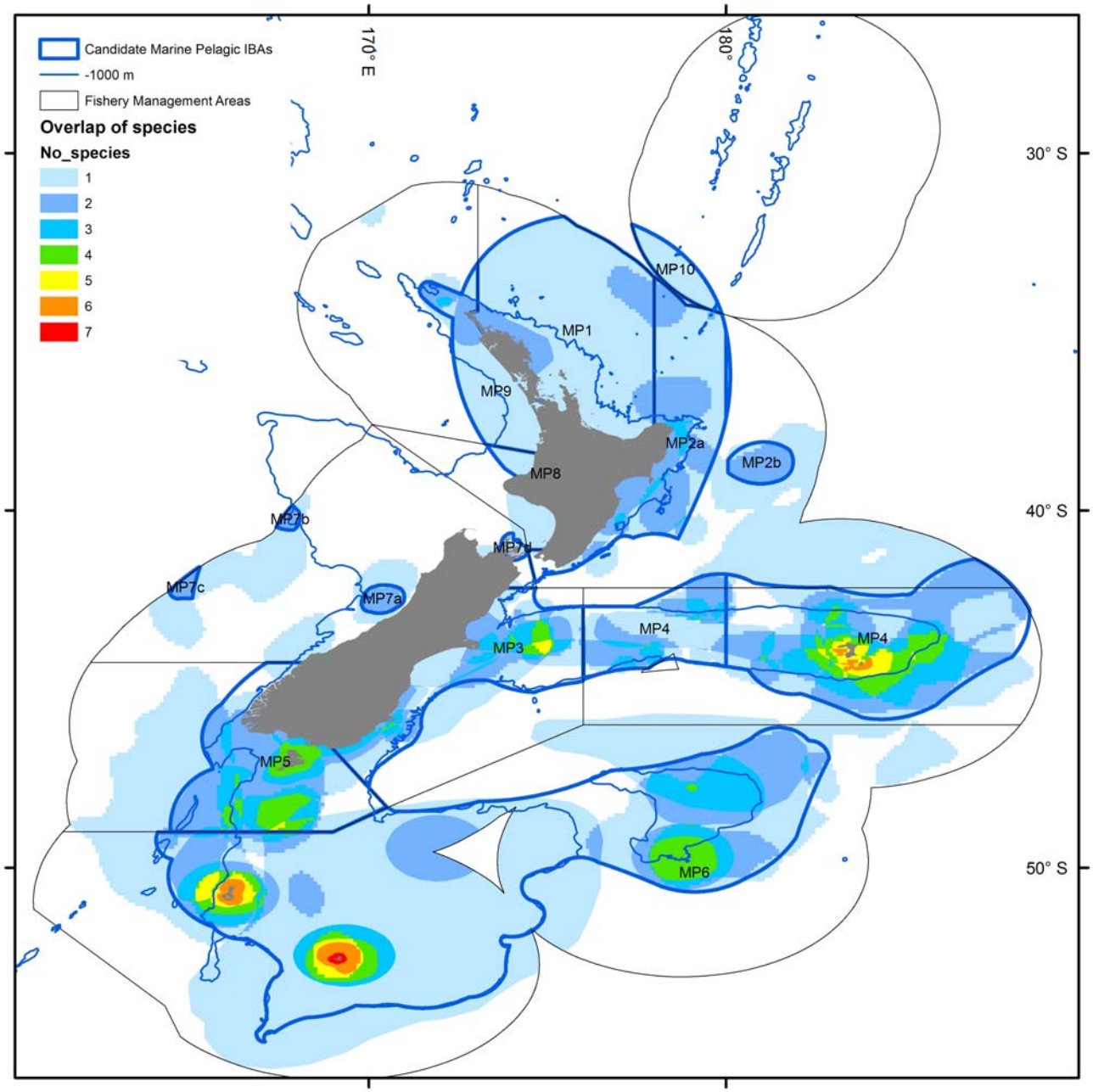

Figure 1. Candidate Marine IBAs (dark blue outlines) determined by the overlap of species foraging ranges (number of species ranges overlapping shown by the coloured zones – see legend for colour key) as a starting point, and in relation to key environmental variables such as continental shelf edge (-1000 m contour). Areas are numbered in relation to the Fishery Management Area in which they fall.

Here we discuss the data that supports the delineation of each candidate IBA, starting with those in the north of the NZEEZ. Note that data for only 21 of the potential 58 threatened species were included in these analyses due to lack of adequate data for the remaining species.

Candidate Marine IBA MP1(North East). – This area has been delineated as it is contains the core foraging area of the Parkinson's (Black) petrel. Other species contributing to the zones defined in this area are Buller's shearwaters, and Antipodean albatrosses.

Candidate Marine IBA MP2a and b (East Cape) – These two areas lie off the eastern tip of New Zealand. Area 2a is defined by foraging areas of Parkinson's (Black) petrel, Antipodean albatross and Buller's shearwater. Area 2b is defined by the overlap of Antipodean and Salvin's albatrosses. In the southern part of this zone, off the coast of Wairarapa and Wellington, we chose to complete the boundary of the candidate area by following the 1000 m contour, which encloses the foraging areas of several species.This occurs in an area where fisheries mortality is common during tuna longline fishing (Figure 2), particularly in the winter months. Consideration could be given to joining areas 2a and 2b together, especially as this intermediate zone is an area of frequent fisheries mortality (Figure 2).

Candidate Marine IBA MP3 (Eastern South Island) – The continental shelf area in this area is heavily used by seabirds, in particular around the Mernoo Bank and around the Otago Peninsula (up to 6 species overlap in any one area). In this area, we used the continental shelf break (-1000m contour) to define the perimeter of the candidate IBA, due to the complex boundary that would result from following the zone of overlap of two or more species. Species contributing to the delineation of this area include northern and southern royal, Antipodean, Buller's, Salvin's albatrosses, yellow-eyed penguin, Hutton's and Buller's shearwaters, white-chinned petrel and Stewart Island shag.

Candidate Marine IBA MP4 (Chatham Rise). – This area is renowned for its diversity of seabirds. High concentrations of species are shown around the Chatham Islands themselves, with up to 6 of the 21 species co-occurring in one area. Albatross species from the sub-Antarctic breeding sites commonly forage along the Chatham Rise. The species contributing to the delineation of the candidate IBA in this area are Chatham, northern and southern royal, Antipodean, and Salvin's albatrosses, white-chinned petrel, and Pitt Island shag. The boundary we define combines the 1000m depth contour and the edge of the zones where two or more species' ranges overlap.

Candidate Marine IBA MP5 (Southland) – This zone is well known for its seabird bycatch in trawl and bottom longline fisheries. Very high diversity of albatrosses and petrels occur around the shelf edges (both at 200m and 1000 m depth contours) and sea mounts within this zone. This is evident in Figure 2, where cumulative mortality over 10 years defines the 200m shelf break in this region, as a result of extensive fishing by trawl and bottom longline methods. Up to five species have overlapping ranges in this area in any one part of MP5. The species co-occurring in this area include both temperate and sub-Antarctic species, and those contributing to the delineation of the candidate IBA are Antipodean, Buller's, southern royal, Campbell and Salvin's albatrosses, yellow-eyed penguin, white-chinned petrel and Stewart Island shag.

Candidate IBA MP6 (Sub-Antarctic) - This large continental shelf encompasses both the Campbell Plateau (encircling the Campbell and Auckland islands) and the Bounty Plateau to the east. Up to seven species ranges overlap in different parts of this area. We chose the boundary of the candidate IBA based on the outline of the Campbell Plateau, in combination with the edge of the core foraging area for Campbell Albatross, and areas of overlap of two or more species ranges. Species contributing to the delineation of the candidate IBA in this area are Antipodean, Buller's, southern royal, Campbell,

grey-headed and Salvin's albatrosses, yellow-eyed and rockhopper penguins, white-chinned petrel, Auckland, Campbell and Bounty shags.

Candidate Marine IBA MP7 a,b,c,d (Western South Island) - In these areas, two or more species distributions overlap in an area, and in places these areas coincide with the 1000m depth contour. Areas MP7a occurs as a result of the overlap of Buller's albatross and Westland petrel. Areas MP7b and c are defined by overlapping distributions of Antipodean albatrosses (breeding and non-breeding groups). Area MP7d is defined by the distribution of New Zealand king shag.

Candidate Marine IBA MP8 (*Taranaki*) – This area is defined by the core foraging area of Parkinson's (Black) petrel.

Candidate Marine IBA MP9 (North Cape) – This zone encompasses the foraging areas of up to three co-occurring species. Bullers' albatross, nesting at the Poor Knights Islands overlap with Parkinson's (Black) petrel and Buller's shearwater to provide the boundary used to delineate the candidate IBA. This small area adjoins IBA MP1 and MP8, with the Parkinson's (Black) Petrel core foraging area extending into this to the north and south.

Candidate Marine IBA MP10 (Kermadec) – This zone is delineated by the core foraging area for Parkinson's (Black) Petrel.

The combination of these candidate IBAs covers most of the New Zealand continental shelf, with the exception of the western areas of the two main islands, from Taranaki to Fiordland (the western points of both islands respectively). These may be areas that are filled by the addition of new data to future analyses. The areas proposed include known foraging areas for most species which have been followed by satellite tracking in New Zealand waters, though the commuting areas between these zones of concentrated foraging effort are largely unrepresented.

Fit to the IBA criteria

The data-selection criteria and method were provided in the guidelines defined in work carried out by BirdLife partners in Europe (SEO/BirdLife 2008). When we examine the fit of the areas defined in this analysis to the key characteristics of IBAs (page 5) we find a good fit:

- IBAs are designed to provide a network of places of significance for the conservation of birds in the New Zealand region. Because of the endemic and threatened nature of species included in the analysis, this significance applies at a global level as well as national level.

- The candidate areas we define are practical tools for conservation, as they highlight areas of greatest importance (for the given set of species and data), for management of interactions of birds with human activities in the marine environment. As we used a combination of existing management boundaries and geographical variables in delineating our candidate IBAs, any conservation actions that may be suggested in these areas can be applied with relative ease within existing administrative zones.

- We applied internationally accepted and scientifically justifiable criteria for selecting the areas, with added areas of single-species use of three areas to ensure coverage for three species in particular (Parkinson's (Black) petrel, New Zealand king shag and Campbell albatross). Thus we

created candidate IBA areas that were large enough to support self-sustaining populations for those species in New Zealand waters. These candidate IBAs will serve as connecting areas for localized intensive activity by a wider range of species.

- In terms of the scale and continuity with other management areas already in place (e.g. Marine Protected Areas, MPAs) the areas we describe are much larger than existing MPAs. Existing MPAs only extend to the 12 nautical mile limit of the Territorial Seas of New Zealand. However, it could be argued that with only 0.3% of the NZEEZ designated as protected area, the scale of existing protection zones cannot hope to cover the ranges of most pelagic seabird species. The candidate IBAs, however, are at a scale that is similar to the area over which fishing regulations for the conservation of seabirds are applied. For example, regulations for the deployment of trawl fishery mitigation apply to Fishery Management Areas 3-7 (New Zealand 2006). Thus we feel we have appropriately fitted the data to the management problems in terms of scale.

Application to marine protection

As part of a series of government meetings, being held in 2008-2009, new areas for marine protection are being examined for areas within the 12 nautical mile boundary of the Territorial Seas, to apply over larger areas than previously entertained (West Coast and Sub-Antarctic regional MPA forums). Areas outside the Territorial Seas are being considered for MPA designation from 2013 onwards. The analyses presented will contribute to the delineation of these MPAs, by formulation the zones in which seabird activity is likely to be most intensive.

These kinds of information are already being incorporated into the definition of MPAs for areas such as the Antarctic (CCAMLR MPA forum) and are under discussion for high seas areas. We see no particular obstacles to extending the analyses into areas of the wider Pacific Ocean or further afield. With a similar data set, for example for the Southern Ocean, it would be possible to delineate areas of intensive usage by multiple species. Geographical boundaries, e.g. shelf-breaks, were vital in defining boundaries in many of our candidate pelagic marine IBAs.

We hope that these analyses will be useful for policy-makers and conservationists in helping to ensure that marine protection is applied in the places and at scales that are useful for seabird conservation. Given the high significance of the New Zealand area for seabirds in general, and albatrosses in particular, it will be important to ensure that sufficiently large areas are protected, either by special protection status, or through the application of fisheries management measures, to cover the zones exploited by these ocean wanderers.

Additional data sources

We examined whether additional data types, aside from species foraging ranges add to the analyses, and change any of the outcomes of the study. In particular, locations of fisheries mortalities and seamounts were available, and these were plotted in relation to the candidate IBAs developed here (Figure 2).

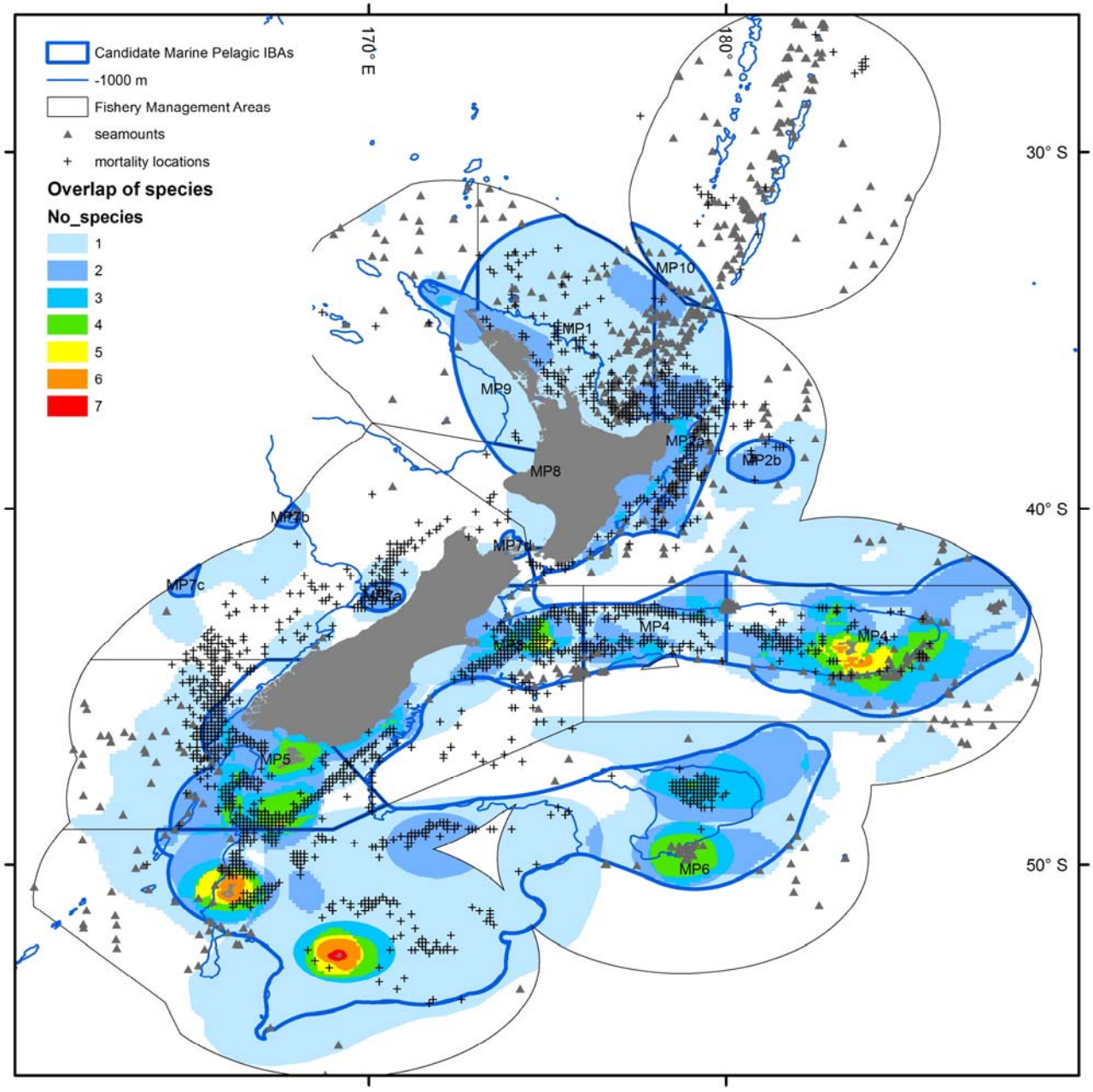

Figure 2. Fishing mortality locations (crosses) and seamounts (grey triangles) plotted against candidate IBA areas for the Marine Pelagic areas.

Figure 2 demonstrates two particular areas of intensive seabird mortality which are not covered by the proposed IBAs – one to the southwest of the New Zealand mainland, and the second to the northeast of MP7a – west of the South Island. Currently, the criteria for selection of IBAs do not allow these areas to be designated, despite sustained incidental mortality in these areas during the 10 years of fisheries monitoring included here.

We also plotted sea mount locations, which are underwater features that come within ten to 5200 m of the surface of the sea. Seamount locations were defined by the National Institute of Water and Atmosphere (NIWA), on the basis of slope, height differential between the base and the top, and other geographical features.

Seamounts do not appear to provide insight into the areas of importance for marine birds. It is possible that filtering of these data, e.g. to exclude those occurring at great depth may lead to a stronger relationship between seabird distribution and seamount location.

This brief analysis suggests that a wider scope of data types, for example, to include threats information, may be useful in determining where IBA boundaries should be in marine systems.

Conclusions

We consider that this initial analyses has defined areas pivotal importance to threatened seabirds, namely around the continental shelves of the New Zealand Exclusive Economic Zone. Significant data gaps hamper our examination of areas further offshore, which may also prove to be vital for sustaining healthy populations of threatened and non-threatened seabirds. Better information about 58 of the 76 species examined in this study (of which 22 threatened species are of highest priority) is necessary to complete the mission of defining the Important Bird Areas of marine habitats of New Zealand.

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